

REMARKS

Claims 1-36 are pending in the present application.

In the office action mailed April 19, 2006 (the "Office Action"), the Examiner rejected claims 1, 2, 4, 7-10, 12-14, 17-19, 22-36 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication No. 2005/0086441 to Meyer *et al.* (the "Meyer reference"). Claims 3, 5, 6, 11, 15, 16, 20, and 21 have been objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

The specification has been amended to move a sentence from one paragraph to another. No new matter has been added by this amendment.

Various embodiments of the invention will now be discussed in comparison to the prior art. Of course, the discussion of the embodiments, and the discussion of the differences between the embodiments and the prior art subject matter, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

The present application describes various embodiments of a memory arbitration system having an arbitration packet protocol. The arbitration packets are provided in advance of an associated memory response and provide an arbitration control circuit 210 of an upstream memory hub with information to enable the appropriate path through the receiving memory hub in anticipation of receiving the associated memory response. The arbitration packet is generated by the arbitration control circuit 210 of a current memory hub while read data for the memory response is being retrieved from memory devices 148. The arbitration packet provides the upstream memory hub with appropriate information to enable the appropriate path through the receiving memory hub for the associated memory response. When the arbitration packet and the memory response have been prepared and are ready for transmission, the upstream memory hub is queried to determine if it is busy. If the upstream memory hub is idle (i.e., available to receive data), the arbitration packet is sent to the upstream memory hub followed by the memory response. The memory response is transmitted through each upstream memory hub in accordance with the arbitration scheme defined by the arbitration packet until the memory response reaches the target destination.

In contrast, the Meyer reference describes a hub-based memory system with memory hubs that can execute various arbitration schemes for handling memory responses. Each of the hubs can execute a different arbitration scheme, for example, some of the memory hubs can give priority to local response over downstream responses, and other memory hubs can have the reverse priority. By assigning different arbitration processes to different memory hubs, the latency of the corresponding memory module can be controlled. The arbitration scheme executed by each memory hub is controlled by a respective arbitration control logic 210. The arbitration control logic is coupled to the queues 202, 206 through a control/status bus which allows the logic 210 to monitor the contents of each of the queues 202, 206 and utilize that information in controlling the multiplexer 208 to control the overall arbitration process executed by the memory hub. Various example arbitration schemes are also described in the Meyer reference. For example, one scheme described is based on a number of memory responses in the local and buffered queue. In another arbitration scheme, an oldest first algorithm is executed in arbitrating between local and downstream memory responses. The Meyer reference is referenced in the present application as describing examples of arbitration schemes suitable for use in the present application.

As previously mentioned, the Examiner has rejected claims 1, 2, 4, 7-10, 12-14, 17-19, 22-36 under 35 U.S.C. 102(e) as being anticipated by the Meyer reference.

Claims 1, 8, 12, 18, 22, 25, 27, 30, 32, and 35 are patentably distinct from the Meyer reference because it fails to disclose the combination of limitations recited by the respective claim. For example, with reference to claim 1, the Meyer reference fails to disclose a method of responding to a read request that includes generating an arbitration packet including data indicative of a data path configuration for the read response, providing the arbitration packet and the read response to an interposing memory hub, and receiving the arbitration packet at the interposing memory hub, decoding the arbitration packet, and enabling a data path for the read response in the interposing memory hub in accordance with the data of the arbitration packet.

Although the Examiner cites the description at paragraphs 19-24 as disclosing the various limitations, *see* the Office Action at page 4, the limitations are not described in the cited material nor are the limitations contemplated. For example, the Examiner cites paragraph 19 as disclosing the generation of an arbitration packet as recited in claim 1. The material in paragraph

19 describes that each memory hub can execute a local desired arbitration process to control the manner in which local and downstream responses are handled. However, there is no mention of generating arbitration packets, or using arbitration packets to program a memory hub to execute a particular arbitration scheme. Similarly, the material at paragraph 24, which has been cited by the Examiner as disclosing providing the arbitration packet prior to the read response, describes the use of an arbitration control logic 210 to execute a local arbitration process in handling local and downstream responses so that the latency of the corresponding memory module can be controlled. Additionally, particular examples are described with reference to Figure 3, a first example having priority given to downstream responses and a second example where priority is given to local responses. The material of paragraph 24 does not, however, discuss the use of an arbitration packet or that an arbitration packet precedes the memory response.

As for paragraph 22, the Examiner specifically references the statement, “[t]he specific operation of the arbitration control logic 210 in controlling the multiplexer 208 to provide responses from one of the queues 202, 206 or the bypass path 204 depends on the particular arbitration process being executed by the control logic.” See the Office action at page 4. As with the material at paragraphs 19 and 24, the use of an arbitration packet that precedes the memory response, and which is decoded so that a data path according to the arbitration packet is enabled, is not described. The material in paragraph 22 discloses that the memory hubs can execute particular arbitration schemes, but does not disclose receiving an arbitration packet for setting the particular arbitration scheme.

Claims 8, 12, 18, 22, 25, 27, 30, 32, and 35 also include limitations regarding an arbitration packet that are not disclosed in the Meyer reference. Claim 8 recites a method of transmitting a read response that includes receiving at the memory hub an arbitration packet including data indicative of a data path configuration for an associated read response, decoding the arbitration packet, and configuring the data path in accordance with the data of the arbitration packet. Claim 12 recites a method for configuring a data path that includes generating at a first memory hub an arbitration packet including data indicative of a data path configuration for an associated read response, providing the arbitration packet to a second memory hub coupled to the first memory hub, decoding the arbitration packet at the second memory hub, and configuring a data path of the second memory hub in accordance with the data of the arbitration packet in

preparation of receiving the associated read response. Claim 18 recites a method of communicating between first and second memory hubs that includes generating an arbitration packet for an associated read response having a command code field including data identifying that it is an arbitration packet and further having a data path field including data indicative of a data path configuration in the second memory hub, transmitting the arbitration packet prior to transmitting the associated read response to the second memory hub, and configuring the data path in the second memory hub in accordance with the data included in the data path field.

Claim 22 recites a memory hub that includes a configurable data path and an arbitration control circuit operable to generate an arbitration packet for an associated read response and further operable to configure the configurable data path in accordance with the data included with an arbitration packet coupled thorough the remote input node in preparation of coupling an associated read response coupled through the remote input node to the output node. Claim 25 recites a memory hub that includes a bypass data path and an arbitration control circuit operable to generate an arbitration packet in response to retrieving read data from a memory device coupled to the memory hub and further operable to receive an arbitration packet from a downstream memory hub and enable the bypass data path to couple a read response received therefrom from the input node to the output node. Claims 27 and 30 recite memory modules having the memory hubs of claims 22 and 25, and claims 32 and 35 recite processor-based systems that include the memory modules of claims 27 and 30.

As previously discussed with reference to claim 1, the Meyer reference does not disclose using arbitration packets for setting the arbitration scheme of an upstream memory hub. The Meyer reference describes a hub-based memory system where each of the memory hubs can execute a local arbitration process to control the flow of local and downstream memory responses.

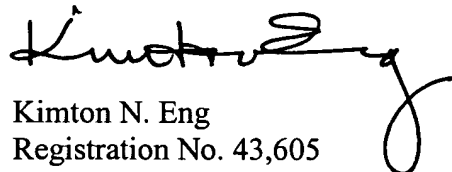
For the foregoing reasons, claims 1, 8, 12, 18, 22, 25, 27, 30, 32, and 35 are patentably distinct from the Meyer reference. Claims 2, 4, and 7, which depend from claim 1, claims 9 and 10, which depend from claim 8, claims 13, 14, and 17, which depend from claim 12, claim 19, which depends from claim 18, claims 23 and 24, which depend from claim 22, claim 26, which depends form claim 25, claims 28 and 29, which depend from claim 27, claim 31, which depends from claim 30, claims 33 and 34, which depend from claim 32, and claim 36,

which depends on claim 35, are similarly patentably distinct based on their dependency from a respective allowable base claim. Therefore, the rejection of claims 1, 2, 4, 7-10, 12-14, 17-19, 22-36 under 35 U.S.C. 102(e) should be withdrawn.

All of the claims pending in the present application are in condition for allowance. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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